Permit Conditions
for
General Research Using Radioactive Materials

Background

General research refers to the use of check sources, calibration standards, small sealed sources, and unsealed radioactive materials used in a general laboratory environment. Authority to possess and use radioactive materials is granted to an individual by the Radiation Safety Committee after the individual's application has been reviewed and approved by the USDA Radiation Safety Staff (RSS).

It is the responsibility of the permit holder named on the Radiation Source Permit to comply with all safety and regulatory requirements of the Nuclear Regulatory Commission (NRC) and the USDA Radiation Safety Program.

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Approved:	By:
10/11/96 Date	/s/ John T. Jensen Director, Radiation Safety Staff

General Laboratory Safety

Eating, drinking, applying cosmetics, and smoking is prohibited in laboratory areas where radioactive materials are used or stored.

Work areas (bench tops, hoods, counters, etc.) shall be covered with absorbent matting or the use of radioisotopes must be conducted within trays to contain spills.

Plexiglas shielding is required to prevent whole body radiation exposure levels from exceeding 5 mR/hr when strong beta emitting radioisotopes such as P^{32} are used.

Lead bricks, foil, or lead impregnated plastic shielding is required to prevent whole body radiation exposure levels from exceeding 5 mR/hr when gamma emitting radioisotopes such as I^{125} or Zn^{65} are used.

Disposable gloves and laboratory coats shall be worn when handling radioactive materials.

Security and Control

Designation of Restricted Areas

Areas where radioactive materials are either used or stored are designated as restricted areas. This designation is for the purpose of radioactive materials security and for radiation exposure control.

Posting of Signs and Labels

Laboratories, rooms, animal facilities, or other approved areas for the use or storage of radioactive materials shall be posted with a "Caution Radioactive Materials" sign or label.

The following information must be posted in a sufficient number of places to allow employees to observe them when entering or leaving a restricted area:

- NRC Form-3 "Notice to Employees",
- Section 206 of the Energy Reorganization Act of 1974;
- The license and any Notice of Violation; and
- Responses to Notices of Violations.

NOTE: If it is impractical to post this information, NRC Form-3 should be posted with a notice that describes these documents and states where they may be examined.

Each container or piece of equipment in which radioactive materials are used and/or stored shall be labeled with a "Caution Radioactive Materials" sign.

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Security and Control, Con't.

Security

The permit holder shall secure radioactive materials in storage against unauthorized access or removal. This includes stock solutions, compounds, samples, and radioactive waste.

The permit holder shall control and maintain constant surveillance over radioactive material in their inventory that is not in storage.

Loss or Theft

The permit holder or Location Radiation Protection Officer (LRPO) shall immediately contact the RSS in case of actual or suspected loss or theft of any quantity of radioactive material.

The RSS will notify the NRC as required by Federal regulation.

Acquisition of Radioactive Materials

Acquisition

Requests for radioactive materials must be approved by the RSS prior to the order being transmitted to the vendor. These requests can be transmitted to RSS by mail, E-mail, or by fax.

After a purchase order is prepared and approved by the facility purchasing agent, the order is to be transmitted to RSS. RSS personnel will review the information, compare the isotope and activity against the permit holder's approved inventory, and transmit the document to the vendor.

Blanket purchase orders may be used to obligate funds. However, each shipment must be requested individually through RSS.

Gratis shipments, replacements for defective orders, transfers from other permit holders, or any other kind of receipt of radioactive material that is not necessarily a purchase, must also be reviewed by the RSS and entered into the computer system for inventory control.

The RSS will transmit a Radioactive Materials Receipt form (RSS-80) and a Radioactive Materials Disposal form (RSS-82) to the facility LRPO, permit holder, or other designated individual to verify the inventory amount.

The permit holder must maintain an accurate and up-to-date inventory of the radioactive materials in their possession. This includes the materials on the RSS inventory and any other sources in the permit holder's possession.

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Receipt Survey Requirements

Packages Exempt from Survey

Packages containing radioactive materials that are shipped as limited quantity are exempt from receipt surveys. These packages do not have a diamond label.

Packages Requiring Survey

Packages containing radioactive materials that are shipped with a White-I, Yellow-II, or Yellow-III diamond shaped label on the outside of the package must be surveyed upon receipt at the facility. Examples of these labels are shown below.

Time Allowed After Receipt for Survey

Packages containing radioactive materials must be surveyed within three hours of receipt if delivered during normal working hours or within three hours from the beginning of the next working day if received after normal working hours.

Package Contamination Surveys

The exterior surface of a package requiring a survey must be monitored for removable contamination by a wipe test. The interior packaging should also be monitored before being discarded.

Package Radiation Level Surveys

The exterior surface of a package requiring a survey must be monitored for external radiation levels with an appropriate portable survey meter.

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Receipt Survey Requirements, Con't.

Survey Limits

The following table lists the limits for package receipt surveys. If the package survey exceeds these limits, call the RSS for guidance.

Table 1: Package Receipt Survey Limits

Survey Type	Limit
Removable Contamination	2,200 DPM
Radiation Level	
White-I	0.5 mR/hr
Yellow-II	10
Yellow-III	100

Transfer and Disposal of Radioactive Materials

A permit holder must receive the prior approval from the RSS before radioactive materials are transferred to or from another licensed or permitted individual.

Disposal of radioactive materials must be performed in accordance with the RSS Technical Bulletin on Radioactive Waste Management. This document is available in the USDA Radiation Safety Handbook.

Laboratory Surveys

Laboratory areas shall be monitored for contamination with an appropriate portable survey meter at the end of each day when radioisotopes are used.

Radiation level and removable contamination surveys shall be conducted either weekly or monthly depending on the amount of radioactive materials used in the area. The following table indicates the frequency of required surveys:

Table 2: Frequency of Required Surveys

Frequency	Amount of Radioisotope Use
Monthly	< 200 µCi per experiment, or < 1 mCi per week
Weekly	200 µCi per experiment, or 1 mCi per week

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Laboratory Surveys, Con't.

A sufficient number of radiation measurements and swipe samples will be taken to assure that contamination has not spread to unrestricted areas of the facility. The survey will include a labeled diagram of the surveyed rooms keyed to counting results and the results of decontamination efforts, if required.

Surveys of radioisotope storage areas shall be performed monthly.

When radioisotope use experiments are not performed in a given month, no survey of the general laboratory is required. Documentation that no survey was performed is required to avoid a gap in the survey records.

Survey results shall be reported in units of activity [disintegrations per minute (DPM) or µCi].

Users of unsealed radioisotopes are required to submit a copy of a typical laboratory survey performed during the prior three months to RSS for review each calendar quarter. RSS will maintain a copy of these reports.

The allowable removable contamination limits for laboratory surveys are specified in the following table.

Table 3: Maximum Removable Contamination Limits (DPM / 100 cm^2)

Type of Area	Low-Risk Beta or Gamma-ray Emitters	Beta or Gamma-ray Emitters	Alpha Emitters
Radioisotope Use Laboratories, Restricted Areas, and Protective Clothing Worn only in a Restricted Area	22,000	2,200	220
Unrestricted Areas, and Personal Clothing Worn Outside a Restricted Area	2,200	220	22

Note: Low risk radioisotopes include H-3, C-14, S-35, and others whose beta energies are less than 0.2 MeV maximum, or whose gamma-ray emission is less than 0.1 R/hr at
1 meter per Curie of activity, e.g. I-125.

Fixed contamination limits are five times the limits specified in this table.

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Radiation Detection Instruments

With the exception of H^3, users of unsealed radioactive materials must have a portable survey meter available to monitor for fixed contamination and for radiation levels. Commonly used radioisotopes and appropriate detectors are listed in Table 4. The meter must also have the sensitivity to detect contamination below the levels specified in Table 3.

Table 4: Appropriate Survey Meters for Various Radioisotopes

Radioisotope	Survey meter / Detector
C^{14}, S^{35}, P^{32}, P^{33}	Thin end-window, pancake Geiger-Muller (GM)
I^{125}	Thin end-window Sodium Iodide (NaI)
Cs^{137}, Cr^{51}, Zn^{65}	Sodium Iodide (NaI)

Portable survey instruments shall be calibrated at intervals not to exceed one year by commercial firms or other qualified individuals. Detection efficiencies for radioisotopes used in the laboratory should also be determined. Portable survey instruments should be tested before each use with a small check source to verify proper instrument operation. Instruments shall be recalibrated when failing to respond to a check source or when serviced.

Laboratory counting equipment should be calibrated on an annual basis by counting standards of known activity. The calibration should consist of an efficiency determination and a determination of the Minimum Detectable Activity for commonly used isotopes.

Sealed Source Leak Tests

Sealed sources containing 100 µCi or more of radioactive materials must be leak tested at intervals not to exceed six months. Sources containing 10 µCi or more of alpha emitting radioisotopes must be leak tested at three month intervals. Sources containing hydrogen-3 (H^3) or krypton-85 (Kr^{85}) are exempt from testing.

The RSS will supply leak test kits, perform the required analysis, and report the results back to the permit holder. The permit holder can use other companies to perform and analyze the leak test provided they are properly licensed to perform that service. It is the responsibility of the permit holder to provide the RSS with a copy of the company's license for verification.

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Sealed Source Leak Tests, Con't.

If the test exceeds 0.005 µCi (11,100 DPM), RSS must be notified immediately in order to notify the permit holder, the NRC, and to contact the manufacturer to determine if special shipping requirements are necessary. Devices exceeding this level are to be removed from service and returned to the manufacturer for repair, replacement, or disposal.

The USDA Radiation Safety Program uses a limit of 1,110 DPM as a notification level. Users of devices exceeding this level will be notified of the test results to make them aware of the potential for source leakage in the future.

Laboratory Close-out

Before releasing a radioisotope laboratory or other work area for unrestricted use, all radioactive materials shall be removed. The laboratory or work area shall then be surveyed and, if necessary, decontaminated. Specific guidance can be found in the RSS Technical Bulletin "Performing Close-out Surveys in Radioisotope Laboratories".

Written authorization must be received from the RSS before a laboratory can be released for unrestricted use.

Records

The following table lists the period of time that records must be retained.

Record Type	Retention Period (Years)	
	Permit Holder	RSS
Purchase or Transfer of Radioisotopes	3	Indefinite
Disposal of Radioisotopes	Indefinite	Indefinite
Radioactive Waste Manifests	Indefinite	Indefinite
Instrument Calibration	3	3
Leak Test Results	3	3
Laboratory Survey Results	3	3

Questions

If there are any questions regarding the information in this document, contact:

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